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TS-PIC-92075 August 1992

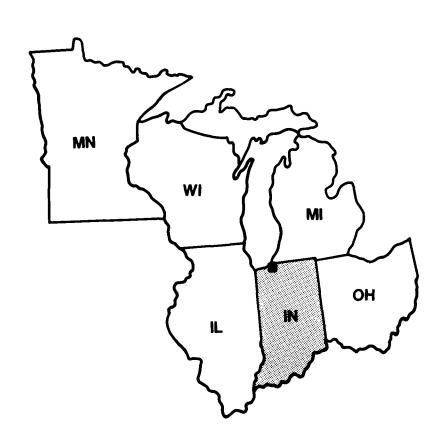


Research and Development

SEPA Site Analysis U.S. Smelter and Lead Refinery, Inc. East Chicago, Indiana

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EPA Region 5 and OERR



Site Analysis U.S. Smelter and Lead Refinery, Inc. East Chicago, Indiana

by Juan C. Bernal, Imagery Analyst The Bionetics Corporation Warrenton, Virginia 22186

Contract No. 68-03-3532

Technical Monitor
Gordon E. Howard, Jr.
Environmental Photographic Interpretation Center
Environmental Monitoring Systems Laboratory
Warrenton, Virginia 22186

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY OFFICE OF RESEARCH AND DEVELOPMENT U.S. ENVIRONMENTAL PROTECTION AGENCY LAS VEGAS, NEVADA 89193-3478

NOTICE

This document has undergone a technical and quality control/assurance review and approval by personnel of the EPA/ORD Environmental Monitoring Systems Laboratory at Las Vegas (EMSL-LV), and is for internal Agency use and distribution only.

ABSTRACT

This report presents an analysis of aerial photography of U.S. Smelter and Lead Refinery, Inc. (USS Lead), located in East Chicago, Indiana. The site was analyzed to assist the Environmental Protection Agency (EPA)'s Region 5 in its assessment of site activities resulting in surface water contamination.

According to collateral information supplied by EPA Region 5, the 31.9-hectare (79-acre) site operated as a smelting operation from about 1906 to 1985. Beginning in 1920, USS Lead operated a primary lead smelting operation, among other activities, on 10.1 hectares (25 acres) of the property. By 1973 it was converted to a secondary smelting operation, recovering lead from scrap metal and old automobile batteries. Operations reportedly ceased in 1985.

The purpose of this analysis is to: 1) identify locations where waste materials may have been stockpiled at the site; 2) document the location of slag and dust material dumping areas; and 3) document any disposal and/or filling that may have occurred in the adjacent wetlands.

Hydric soils information from the USDA county soil survey and wetlands delineated on the National Wetlands Inventory Maps have been annotated onto the 1983 photography for the area within a 1-kilometer (0.6-mile) radius of the site.

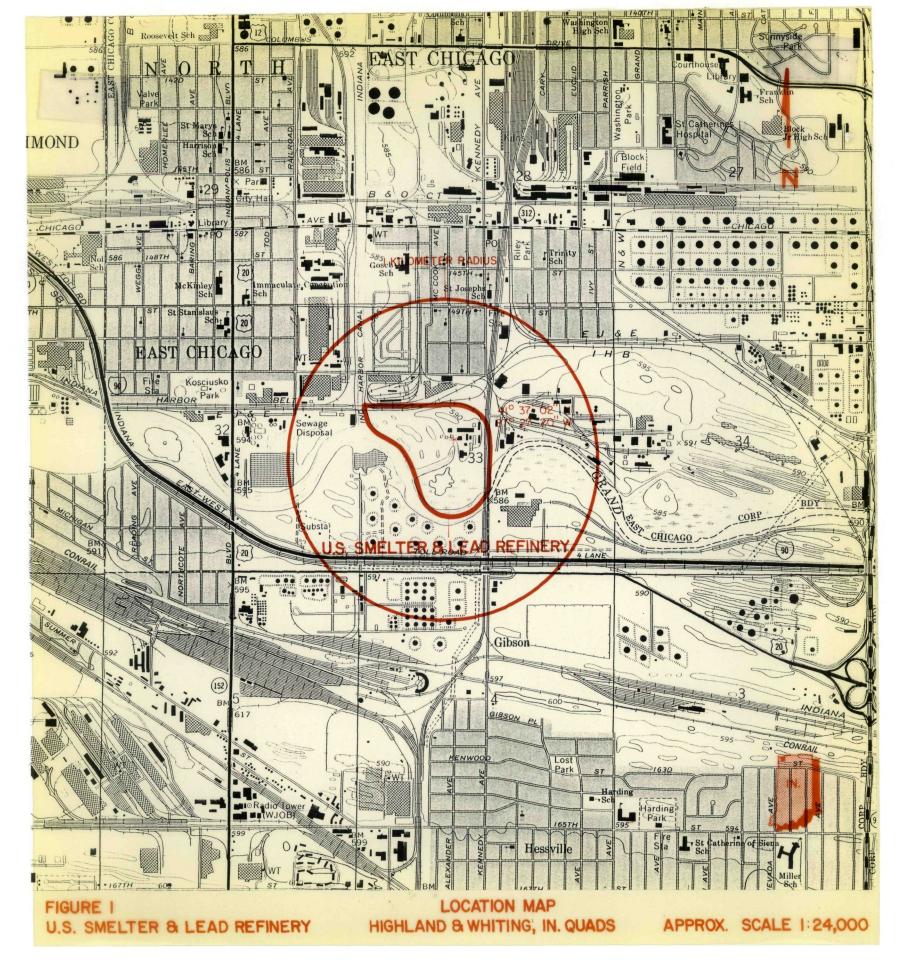
The EPA's Environmental Photographic Interpretation Center in Warrenton, Virginia, a branch of the Advanced Monitoring Systems Division of the Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, performed this analysis at the request of the Superfund Support Section of EPA Region 5 in Chicago, Illinois and the Office of Emergency and Remedial Response in Washington, D.C. This analysis covers the period from 1939 to 1990, and the report was completed in August 1992.

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41° 37' 02" N 87° 27' 20" W

U.S. SMELTER & LEAD REFINERY



FIGURE I
U.S. SMELTER & LEAD REFINERY

LOCATION MAP
HIGHLAND & WHITING, IN. QUADS

APPROX. SCALE 1:24,000



INTRODUCTION

An analysis of aerial photography was performed on the U.S. Smelter and Lead Refinery, Inc. (USS Lead), located in East Chicago, Indiana. The site comprises 31.9 hectares (79 acres) and is bordered by the Indiana Harbor Belt Railroad to the north; Kennedy Avenue to the east; the East West Toll Road and the east branch of the Grand Calumet River to the south; and the Indiana Harbor Canal to the west.

Figure 1 shows the site location, keyed to a photocopy of a mosaic of two U.S. Geological Survey (USGS) 1:24,000-scale topographic maps. Site boundaries or areas used in this analysis were determined from observations made from the aerial photography in conjunction with collateral data supplied by EPA Region 5 and do not necessarily denote legal property lines or ownership.

The 1983 photography (Figure 2) shows the locations of hydric soils from the USDA county soil survey and the wetlands as delineated on the National Wetlands Inventory Maps for the area within a 1-kilometer (0.6-mile) radius of the site.

According to collateral information supplied by EPA Region 5, a copper smelter was in operation at the site from about 1906 to 1920. Beginning in 1920, USS Lead operated a primary lead smelter operation, among other activities, on 10.1 hectares (25 acres) of the property. In 1973, USS Lead converted the operations to a secondary smelting refinery, recovering lead from scrap metal and old automobile batteries. These operations ceased in December 1985.

The site was analyzed to assist EPA Region 5 in its assessment of site activities resulting in surface water contamination in support of a remedial investigation at the site. The analysis identifies the locations where waste materials generated from smelting operations were stockpiled at the site, and documents any disposal of slag and dust material as well as any filling that may have occurred in the adjacent wetlands.

Aerial photography of USS Lead was obtained to represent the period from 1938 to 1990. Black-and-white photography from 1938, 1939, 1949, 1951, 1954, 1958, 1959, 1961, 1965, 1967, 1970, 1973, 1975, and 1976; color photography from April 1983, 1986, and 1990; and color infrared photography from May 1983 and 1987 were used for this analysis. Photography from 1938, 1958, 1975, May 1983, and 1987 was analyzed but not reproduced for this report due to the poor resolution of the photography and/or the lack of significant features, activities, and/or change. Any significant changes noted in those years will be annotated and discussed in the following year of photography reproduced in this report.

The EPA's Environmental Photographic Interpretation Center in Warrenton, Virginia, a branch of the Advanced Monitoring Systems Division of the Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, performed this analysis at the request of the Superfund Support Section of EPA Region 5 in Chicago, Illinois and the Office of Emergency and Remedial Response in Washington, D.C. This analysis covers the period from 1938 to 1990, and the report was completed in August 1992.

¹A complete listing of maps and photography used in this report is provided in the References section.

METHODOLOGY

A search of government and commercial sources was undertaken to obtain the best available aerial photography of the site spanning the desired time frame. The photography and other sources of information used in this report are listed in the References section.

The analysis was performed by viewing backlit transparencies of aerial photography through stereoscopes. Stereoscopic viewing creates a perceived three-dimensional effect which, when combined with viewing at various magnifications, enables the analyst to identify signatures associated with different features and environmental conditions. The term "signature" refers to a combination of visible characteristics (such as color, tone, shadow, texture, size, shape, pattern, and association) which permit a specific object or condition to be recognized on aerial photography.

The terms "possible" and "probable" are used to indicate the degree of certainty of signature identification. "Possible" is used when only a few characteristics are discernible or these characteristics are not unique to a signature. "Probable" is used when incrementally more characteristics are discernible. No qualifying terms are used when the characteristics of a signature allow for a definite feature identification.

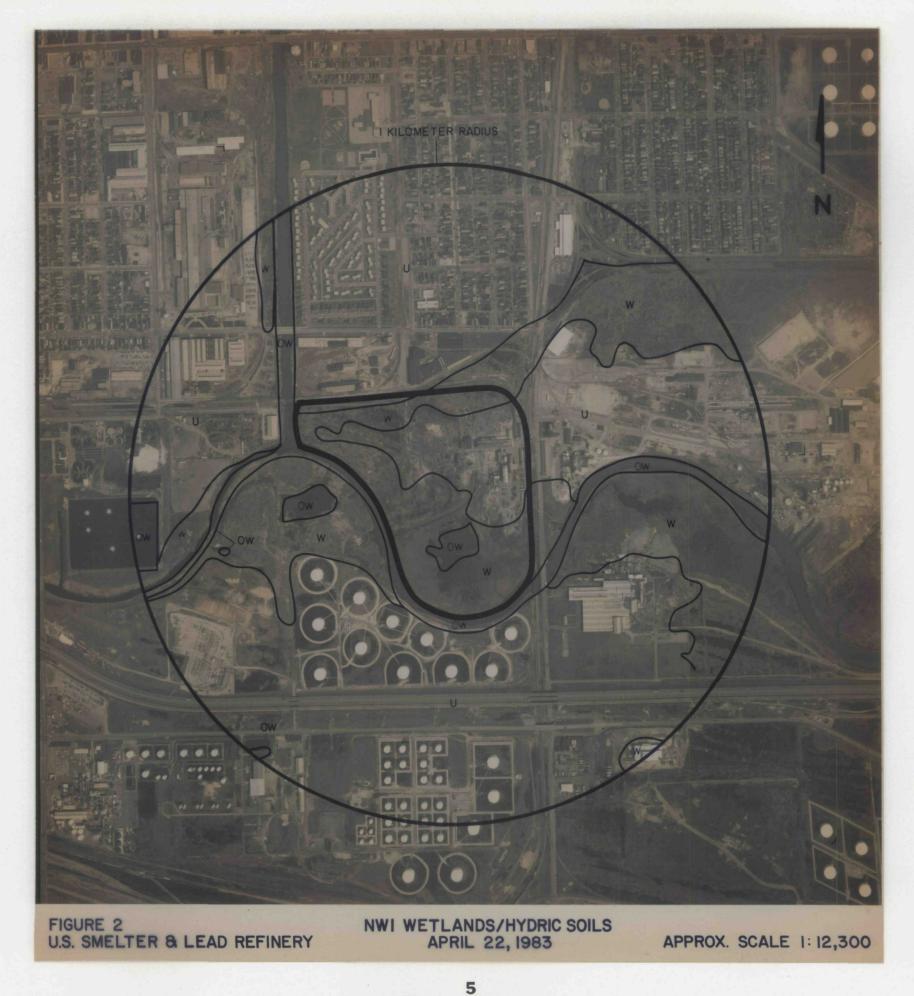
Photographic prints were made from those years of aerial photographic coverage that reveal significant information about the site. The analyst's findings are annotated on overlays to prints and/or base maps and described in the accompanying text. Site boundaries or areas used in this analysis were determined from observations made from the aerial photography in conjunction with collateral data supplied by EPA Region 5 and do not necessarily denote legal property lines or ownership.

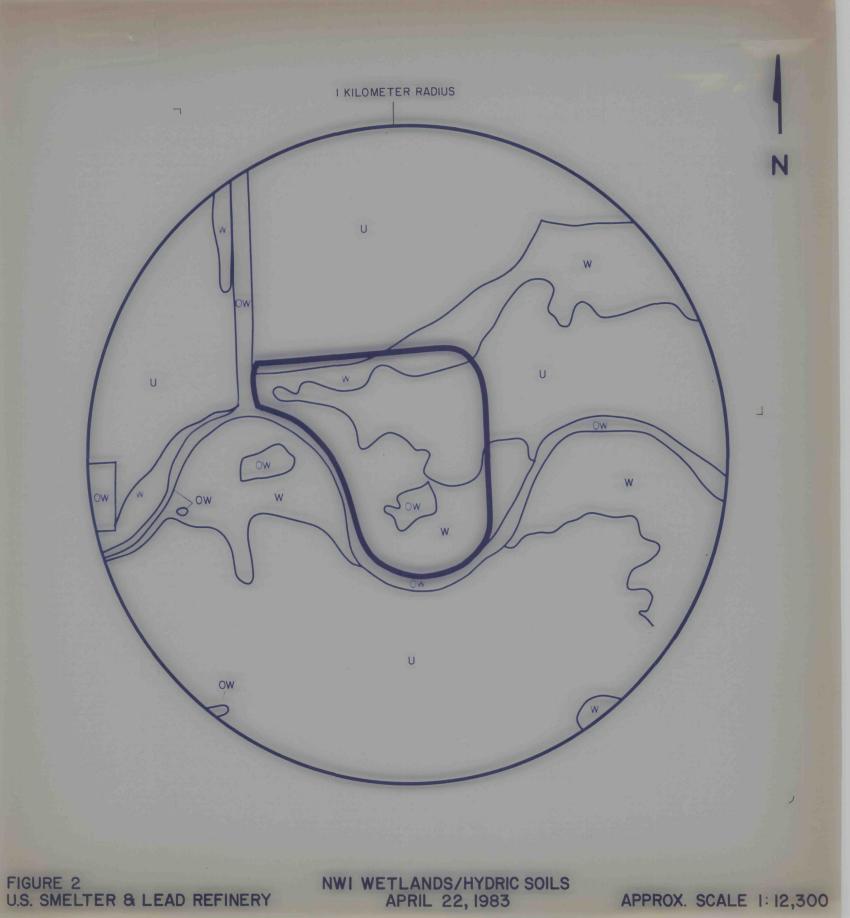
Due to factors inherent in the photographic printing process, prints do not exhibit the level of detail that is visible in the original aerial photography. Therefore, some features identified from the aerial photography may not be clearly discernible, or even visible, on the photographic prints presented in this report.

NWI WETLANDS TRANSFER ANALYSIS

Wetland delineations are included on an overlay to the 1983 photography (Figure 2) in an effort to identify wetlands within a 1-kilometer (0.6-mile) radius of the site. Placement of wetlands boundaries is based on the presence of soils series that are listed as hydric by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS) publication Hydric Soils of the United States, and/or by the use of the National Wetland Inventory (NWI) map of the area published by the U.S. Fish and Wildlife Service (FWS). The USDA SCS definition of hydric soil is as follows: "A hydric soil is a soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper part."

Designations of open water systems such as lakes, ponds, and rivers in the USDA SCS or NWI publications are annotated as open water (OW) in the analysis. Some upland (U) areas may be included within delineated wetlands due to the anthropogenic changes that have occurred since the publication of the Soil Survey and/or NWI map. Soil series are established by using SCS county soil surveys and/or information from state soil scientists. This data transfer of wetlands information is not meant to include all possible wetlands surrounding the site or to delineate jurisdictional upland/wetland boundaries. The utility of this effort lies in designating the most probable location of wetlands within the study area.







AERIAL PHOTO SITE ANALYSIS

JUNE 5, 1939 (FIGURE 3)

Due to the poor quality of the October 31, 1938 film, the 1939 film will be the earliest photograph used in showing the U.S. Smelter and Lead Refinery in operation. Because of the poor film resolution, many features could not be positively identified. However, some of the features that were noted during this year are areas of probable furnace dust, seen as the light-toned (LT) material (M), and the disposal and/or storage of probable furnace slag material which is seen as dark-toned (DK) material. The light-toned probable dust areas are visible generally north and west of the facility, while the dark-toned probable slag material areas are generally south of the facility. Both of the aforementioned areas were also visible on the 1938 film. Horizontal tanks (HT), a probable slag disposal area (SDA), open storage (OS) areas, a probable pit with liquid (LQ), and areas of possible waste disposal (WDA) are also visible.

According to collateral data, much of the dust was stored and/or disposed in the northern portion of the site, while the slag was disposed primarily in the slag disposal area along the south edge of the facility. This slag was used as fill material along the wetland areas.

A drainage analysis was performed for this year. Any significant changes observed in subsequent years will be annotated and discussed. The surface drainage appears to flow southward to merge with the Grand Calumet River, which empties into Lake Michigan. The discharge channel noted south of the facility will no longer be annotated, due to its consistent presence throughout the analysis.

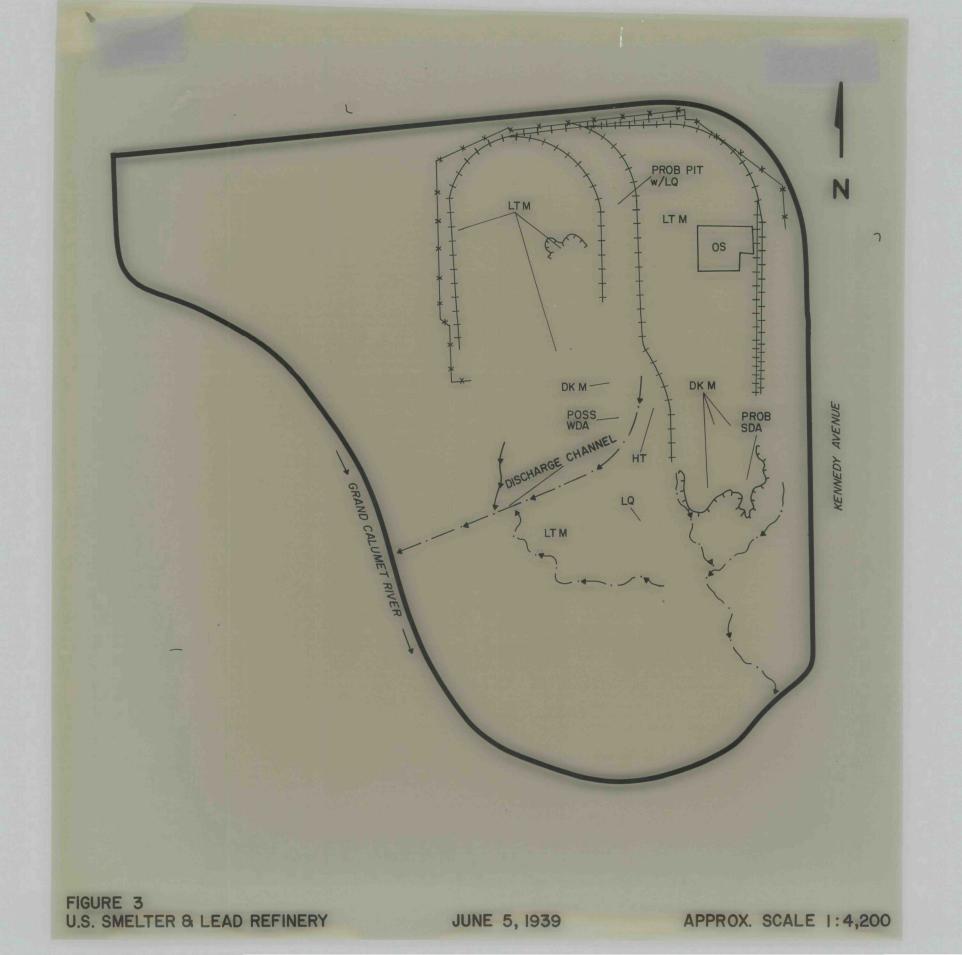


FIGURE 3 U.S. SMELTER & LEAD REFINERY

JUNE 5, 1939

APPROX. SCALE 1:4,200

- LEGEND - Cylindrical Objects
 - Drums
 - Debris
 - Dark-Toned
 - Extraction Area D DB DK EX - Ground Scar - Horizontal Tank GS HT - Loading Dock - Liquid - Light-Toned - Material - Mounded Material
- MM Mounded Mater
 MT Medium-Toned
 NB New Building
 OB Open Burning
 OS Open Storage
 OW Open Water
 R Refuse REV - Revegetation SDA - Slag Disposal Area
- ST Stain TR Trench TT Tank Truck - Uplands - Vertical Tank
- Wetlands WDA - Waste Disposal Area WS - Wet Soil
- TTTT - Edge of Slope Feature Boundary
- x- Fence - - Natural Drainage + - Railroad
 - Site Boundary



LEGEND CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area W - Wetlands WDA - Waste Disposal Area WS - Wet Soil

- Fence - Natural Drainage - Railroad - Site Boundary

APRIL 20, 1949 (FIGURE 4)

A pit containing possible liquid is noted between the two centrally located railroad tracks. An area of light-toned mounded material (MM) is seen along the western fenced area. A vertical tank (VT) and three areas of dark-toned mounded material are visible north of a possible open storage area located near the central portion of the site. Two possible pits are noted north of two additional areas of dark-toned mounded material. The northeastern area of light-toned material that was seen in 1939 appears to contain both light- and dark-toned material from possible grading. Several aligned items (not annotated) are noted within the northeastern open storage area. Two possible stains (ST) are noted near the center of the facility. Three vertical tanks are visible adjacent to the railroad tracks along the east edge of the facility. Three areas of dark-toned mounded material are discernible south and southeast of the largest open storage area. Three mounds of this same material appear to be in another open storage area, waiting to be moved to the slag disposal area in the southern portion of the facility. Eight cylindrical objects (CO), variably toned and textured debris (DB), and a vertical tank are visible within the slag disposal area. Three horizontal tanks and a pit containing liquid are seen east of the discharge channel. Because no changes are noted to the horizontal tanks or pit with liquid throughout the analysis, these features will no longer be discussed, but they will be annotated in each year of analysis hereafter.

An area that appears to be a shallow depression which contains two probable stains is visible on the west side of the discharge channel. A possible waste disposal area containing several piles of debris (not annotated) is visible in this area as well. This area may be a southern extension of the slag disposal area.

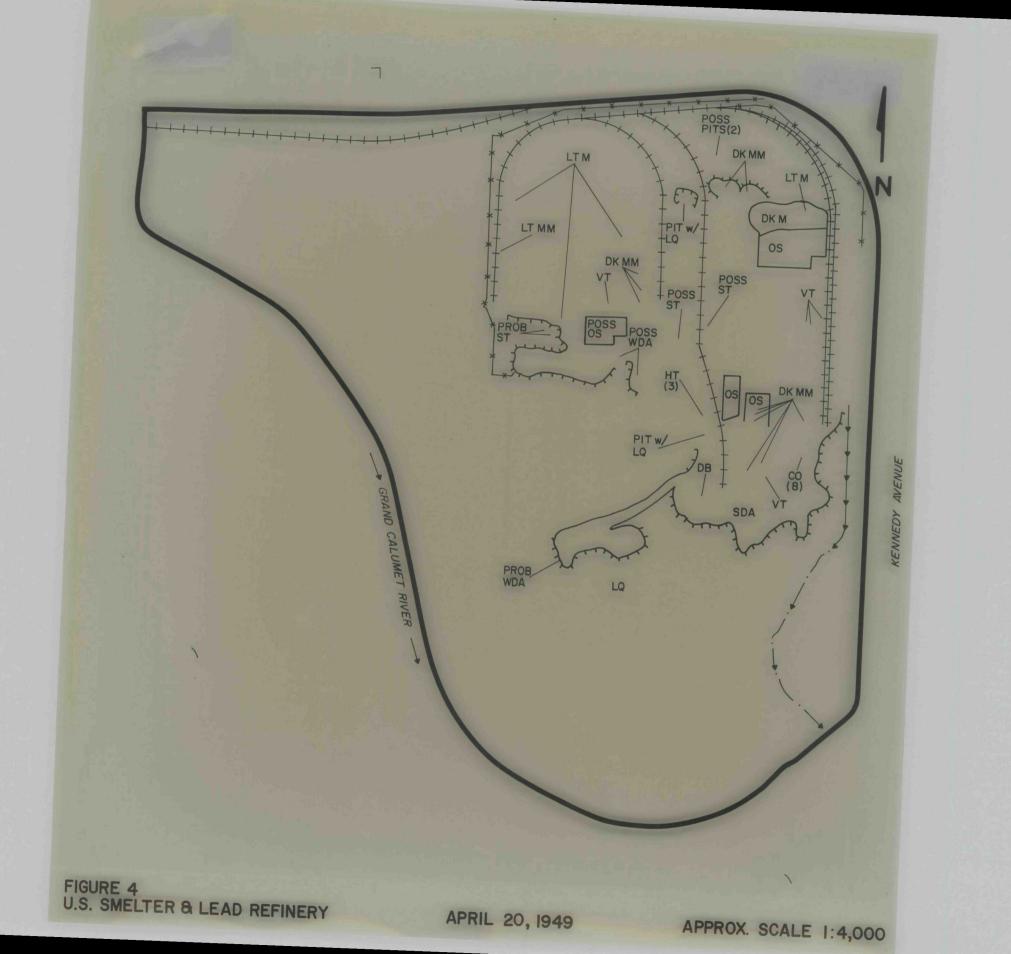
- Channelized Drain
- Edge of Slope
- Feature Boundary
- Fence
- Natural Drainage
- Railroad
- Site Boundary

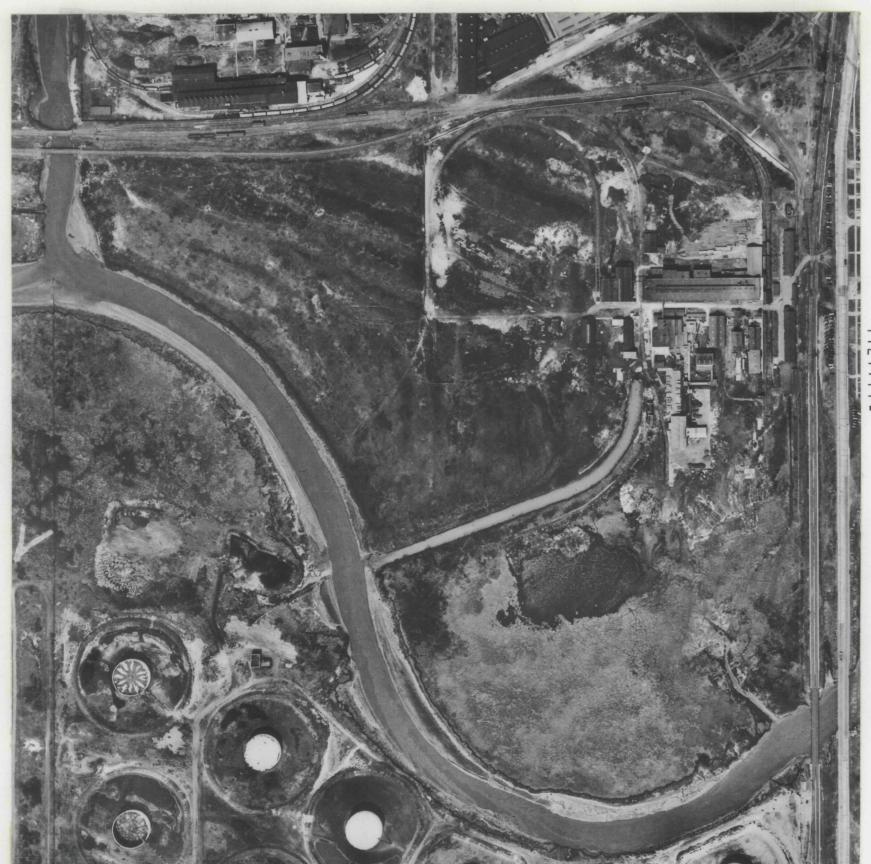


FIGURE 4 U.S. SMELTER & LEAD REFINERY

APRIL 20, 1949

APPROX. SCALE 1:4,000





LEGEND

CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar

GS - Ground Scar HT - Horizontal Tank LD - Loading Dock LQ - Liquid LT - Light-Toned M - Material

M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil

- - Access Road

- Channelized Drainage

TTTT - Edge of Slope - Feature Boundary

x - Fence

- Natural Drainage +++ - Railroad

- Site Boundary

DECEMBER 9, 1951 (FIGURE 5)

The area of light-toned mounded material along the western fenced area is still present. Excavation (EX) activity is noted in an area where light-toned material was previously seen. One large pit containing liquid is seen in the area in which the two possible pits were noted north of one large mound of dark-toned material. The northeastern area of light-toned material that was seen in 1949 appears to contain a combination of both light- and dark-toned material and is annotated as medium-toned (MT) material. The northeastern open storage area is empty. One large area of light-toned material is discernible east of an open storage area. Three large areas of dark-toned mounded material are noted north of the slag disposal area. Two of these mounds appear to be in an open storage area. Another probable waste disposal area is visible along the southeast edge of the discharge channel. A possible trench (TR) is noted along the south edge of the discharge channel. A small possible open storage area is discernible south and east of an area that appears to be a shallow depression that contains two possible pits with liquid. The possible waste disposal area containing several piles of debris (not annotated) is still visible in the southwestern portion of the facility. A probable area of liquid within the wetlands is noted south of the possible waste disposal area. A possible access road (not annotated) leads from the western fence line to near the Grand Calumet River.

LEGEND

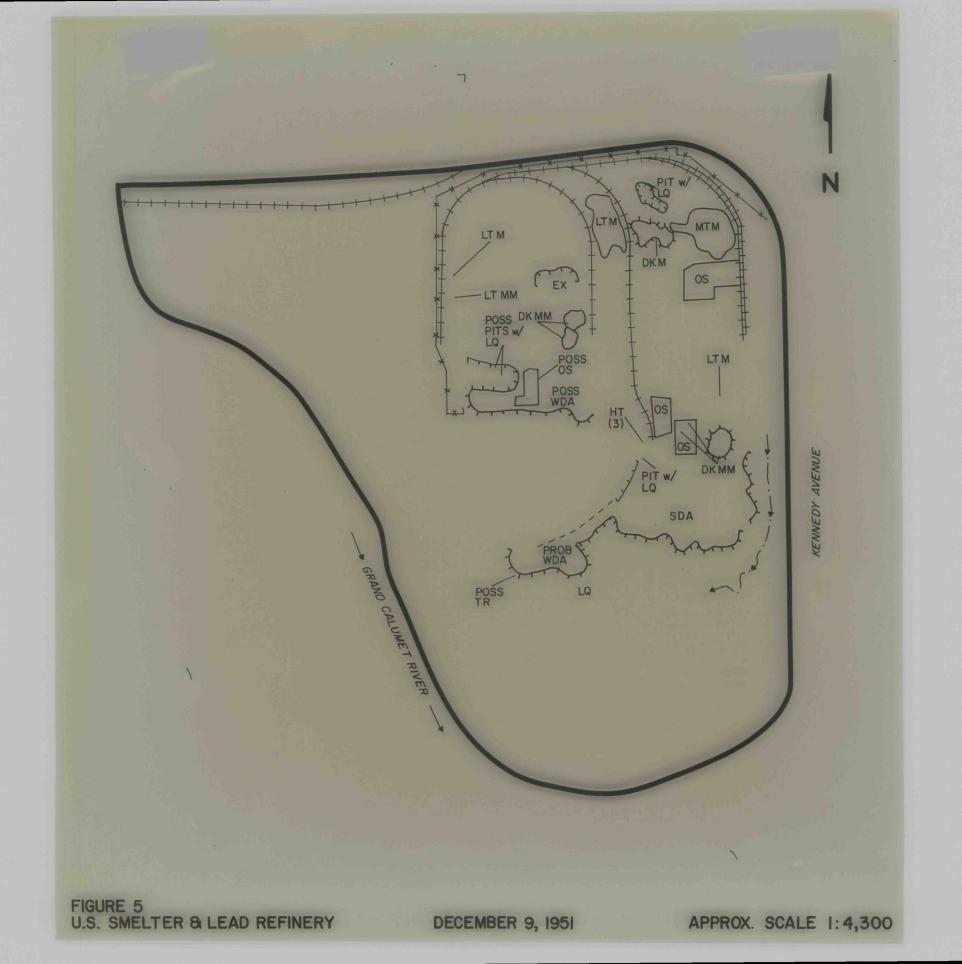
CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area EX - Extraction A GS - Ground Scar GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material MM - Mounded Mater
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse REV - Revegetation SDA - Slag Disposal Area ST - Stain - Trench - Tank Truck TR - Uplands - Vertical Tank - Wetlands WDA - Waste Disposal Area
WS - Wet Soil --- Access Road
---- Channelized Drainag TTTT - Edge of Slope Feature Boundary - - Fence · - - Natural Drainage + - Railroad - Site Boundary



FIGURE 5
U.S. SMELTER & LEAD REFINERY

DECEMBER 9, 1951

APPROX. SCALE 1:4,300



LEGEND

LEGEND

CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil

- Edge of Slope
- Feature Boundary

x - Fence - Natural Drainage +++ - Railroad

- Site Boundary

JULY 1, 1954 (FIGURE 6)

Due to the poor quality of the film, many of the features noted could not be positively identified. The pit and excavation areas that were noted in the north central portion of the site in 1951 appear to have been filled and are in a state of revegetation (REV). The area of light-toned mounded material seen along the western fenced area is still present, but no activity is noted in this area at this time. The large mound of dark-toned material seen in 1951 is still present, and a second mound of dark-toned material occupies a portion of the eastern open storage area. An area of light-toned material is visible adjacent to the mound of dark-toned material. Little activity is noted at the northeastern open storage area. Two large areas of mounded material are discernible east of the discharge channel. A large area of dark-toned mounded material is noted north of the slag disposal area. Several other smaller mounds of material (not annotated) are present to the north of the slag disposal area. The probable waste disposal area seen along the southeast edge of the discharge channel is still present. A possible drainage channel is emanating from the liquid-filled pit south of the three horizontal tanks. The possible waste disposal area containing several piles of debris (not annotated) and mediumtoned material (not annotated) is still visible. The probable area of liquid noted south of the possible waste disposal area in 1951 is no longer discernible.

LEGEND CO - Cylindrical Objects
D - Drums
DB - Debris DB - Debris

DK - Dark-Toned

EX - Extraction Area

GS - Ground Scar

HT - Horizontal Tank

LD - Loading Dock

LQ - Liquid

LT - Light-Toned

M - Material MM - Mounded Material MM - Mounded Mater
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse REV - Revegetation SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Verlands W - Wetlands WDA - Waste Disposal Area WS - Wet Soil - - Access Road

- - Channelized Drainage - Edge of Slope - Feature Boundary

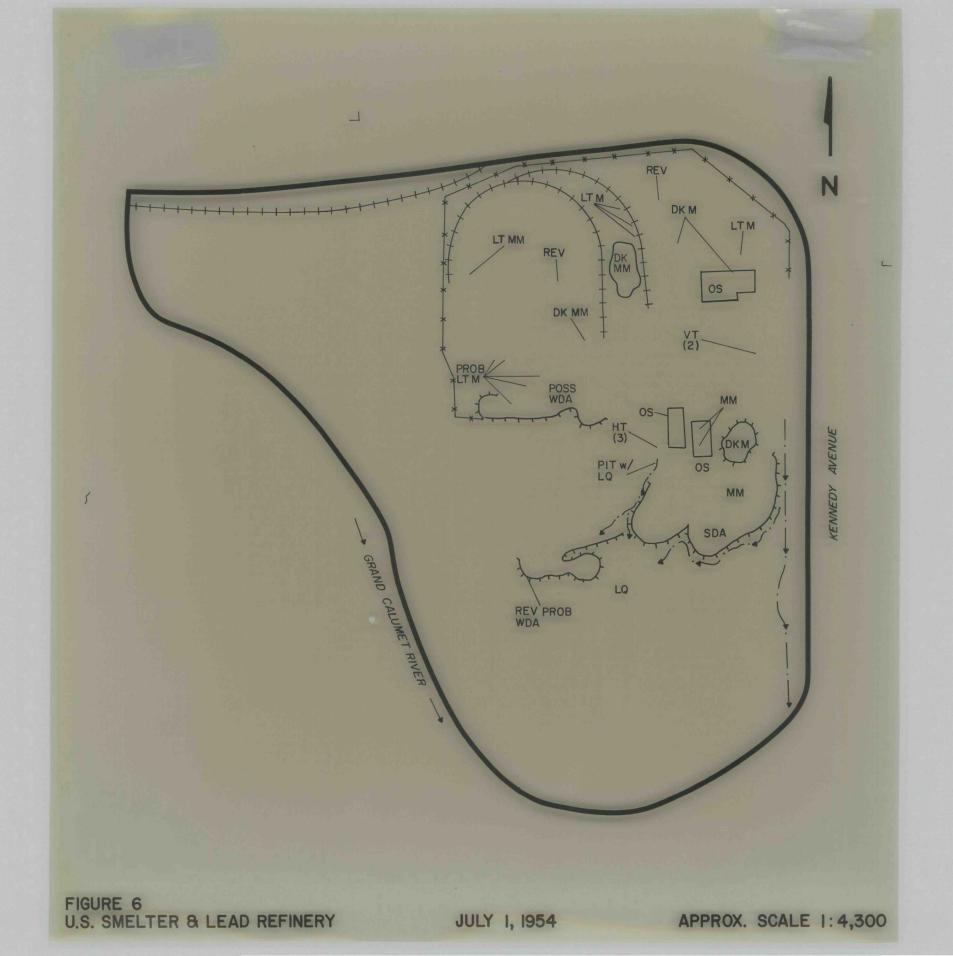
x - Fence - Natural Drainage
- Railroad
- Site Boundary



FIGURE 6
U.S. SMELTER & LEAD REFINERY

JULY 1, 1954

APPROX. SCALE 1:4,300





LEGEND

LEGEND

CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MM - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil

- - Feature Boundary

x - Fence -·-- - Natural Drainage ++ - Railroad - Site Boundary

13

SEPTEMBER 3, 1959 (FIGURE 7)

The 1958 photography was analyzed but not reproduced because of the lack of significant features, activities, and/or change. However, any significant features noted during the 1958 analysis will be annotated and discussed during this year of analysis.

Most of the north central portion of the site appears to be revegetating, and no significant features or activities are noted. Excavation activity is apparent in an area of light-toned material along the western fenced area. Although the excavation area appears to be in the same general vicinity as that seen in 1949, the activity covers a larger area. The two areas of dark-toned mounded material are visible southwest of a possible horizontal tank and west of the most northwestern building. In 1958 a probable drainage ditch (not annotated) was seen between the two centrally located railroad tracks, in the same location where an area of dark-toned material was seen in 1954. The probable drainage ditch appeared to flow north away from the building.

A large horseshoe-shaped area is visible north of the eastern open storage area. This area is first seen in 1958 and probably acts as a tractor trailer turnaround area. Several possible crates (not annotated) are noted within the adjacent open storage area. In 1958 two other areas of light-toned material were visible in and near the western portion of the same open storage area. Only one area of light-toned material is visible in 1959. Four vertical tanks are discernible in the eastern portion of the facility; three were visible in 1958.

Possible stains are noted northeast of the centrally located open storage area. Two new buildings (NB) are visible at the center of the facility adjacent to the open storage area, which contained mounded material in 1954. Both of the buildings were first seen in 1958. Several (approximately 25-30) mounds of variably textured and toned material were noted in and around the slag disposal area in 1958. Thirteen mounds of material (not annotated) are present during this year of analysis. The extent of the waste disposal area along the south edge of the discharge

LEGEND CO - Cylindrical Objects
D - Drums - Debris DB - Debris

DK - Dark-Toned

EX - Extraction Area

GS - Ground Scar

HT - Horizontal Tank

LD - Loading Dock

LQ - Liquid

LT - Light-Toned

M - Material M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Are REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil --- Access Road
---- Channelized Drainage

- Edge of Slope
- Feature Boundary

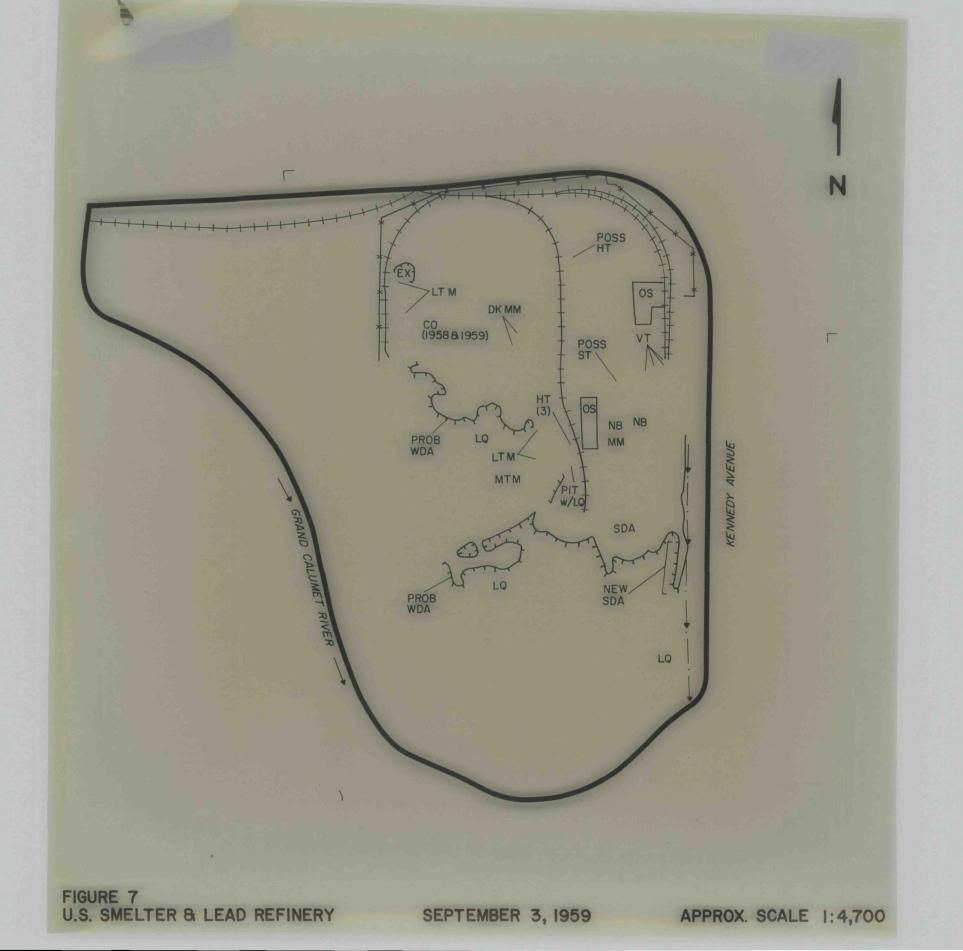
- Fence - Natural Drainage
- Railroad
- Site Boundary



FIGURE 7 U.S. SMELTER & LEAD REFINERY

SEPTEMBER 3, 1959

APPROX. SCALE 1:4,700



LEGEND

CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil

x - Fence - Natural Drainage
- Railroad
- Site Boundary

channel has increased. An expansion of the slag disposal area is visible in the southeastern portion of the site. This first appears on the 1959 photography.

An area of light- and medium-toned material is partially aligned along the north edge of the discharge channel. No signs of the possible open storage area are visible in the southwestern portion of the facility.

NOVEMBER 29, 1961 (FIGURE 8)

An area exhibiting several stains is noted adjacent to the excavation area which is located in the western portion of the facility. This area appears to have been excavated in order to lay a possible pipeline. No change is noted at this excavation area, but some activity is noted in the smaller excavation area to the east. The smaller excavation area is larger than it was in 1959. With the exception of the smaller excavation area, the north central portion of the site appears to be inactive. Two areas of dark-toned material are visible west and southwest of the possible horizontal tank. Several possible crates (not annotated) are noted within the open storage area in the northeast corner of the site. The two areas of light-toned material seen in 1959 are still visible in and near the western portion of the eastern open storage area. Only one of the four vertical tanks seen in 1959 is discernible northeast of the open storage area at the center of the facility. Several mounds of variably textured and toned material are visible in and around the slag disposal area. The waste disposal area along the south edge of the discharge channel has apparently been left to revegetate. The area of light- and medium-toned material that was partially aligned along the north edge of the discharge channel is still visible. Several small areas of light-toned material are seen within the probable waste disposal area west of the facility.

LEGEND - Cylindrical Objects
- Drums
- Debris
- Dark-Toned
- Extraction Area CO D DB DK EX GS HT - Ground Scar - Horizontal Tank LD LQ LT M - Loading Dock - Liquid - Light-Toned - Material MM - Mounded Material - Medium-Toned - New Building MT NB - New Building
- Open Burning
- Open Storage
- Open Water
- Refuse OB os OW R R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Vertical W - Wetlands WDA - Waste Disposal Area WS - Wet Soil

- Site Boundary

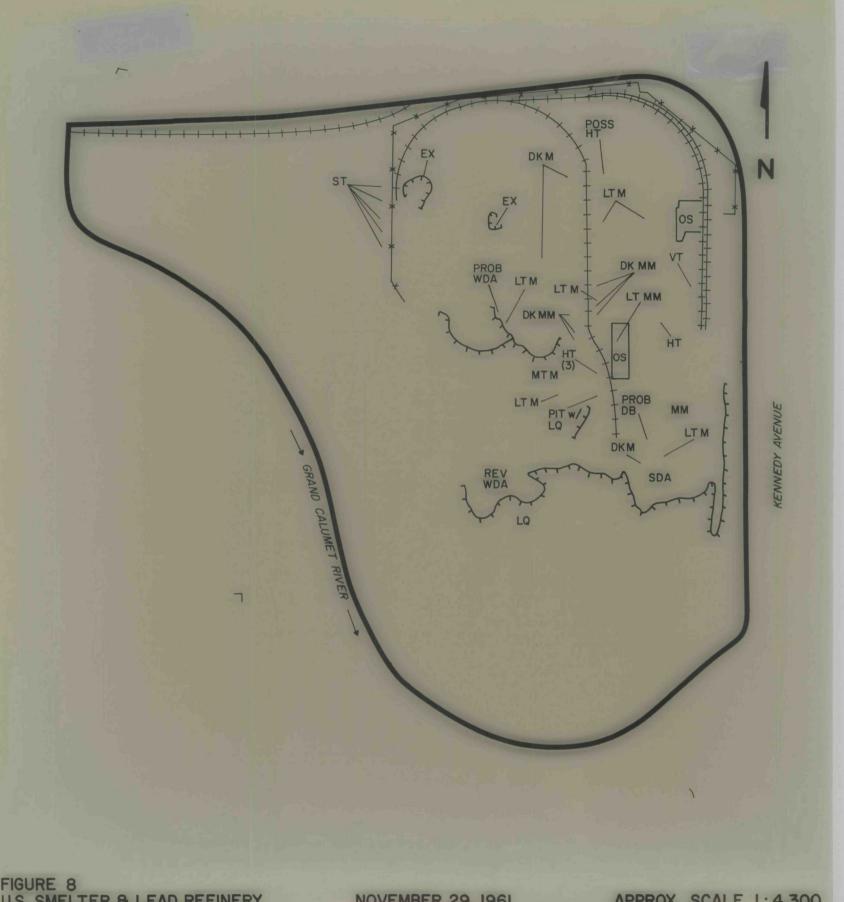
- Fence - Natural Drainage + - Railroad



FIGURE 8 U.S. SMELTER & LEAD REFINERY

NOVEMBER 29, 1961

APPROX. SCALE 1:4,300



CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil

- Edge of Slope
- Feature Boundary
- Fence
- Natural Drainage

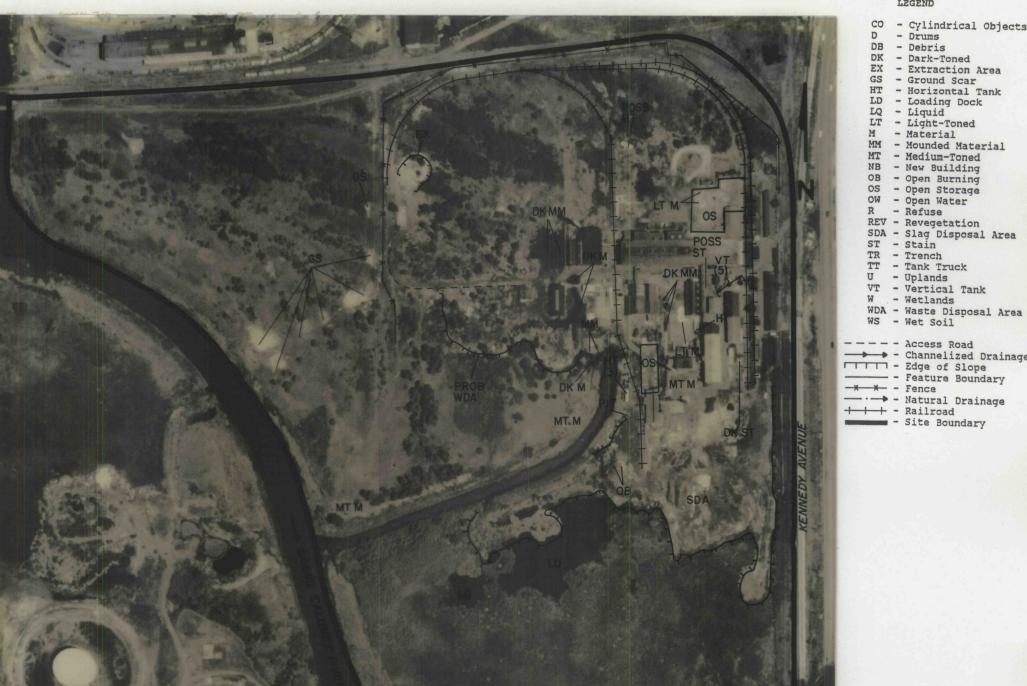
- Railroad - Site Boundary

JULY 15, 1965 (FIGURE 9)

Revegetation is still apparent in most of the north central portion of the site. Little if any excavating activity is visible since the previous year of analysis in the area of light-toned material along the western fenced area. The two areas of dark-toned mounded material that were visible west and south of the most northwestern building are still present. A possible loading dock (not annotated) is seen at the northwest corner of the eastern open storage area. Several possible crates (not annotated) and smaller areas of light-toned material are noted within the open storage area. Five vertical tanks are visible south of the open storage area. Possible stains are noted west of the vertical tanks. Still visible in and around the facility and the slag disposal area are several mounds of variably toned and textured material. Two areas of open burning (OB) are evident on the south edge of the discharge channel.

The area of medium-toned material that is partially aligned along the north edge of the discharge channel has increased in size. Another possible area of medium-toned material is discernible in the western portion of the site, near the end of the discharge channel.

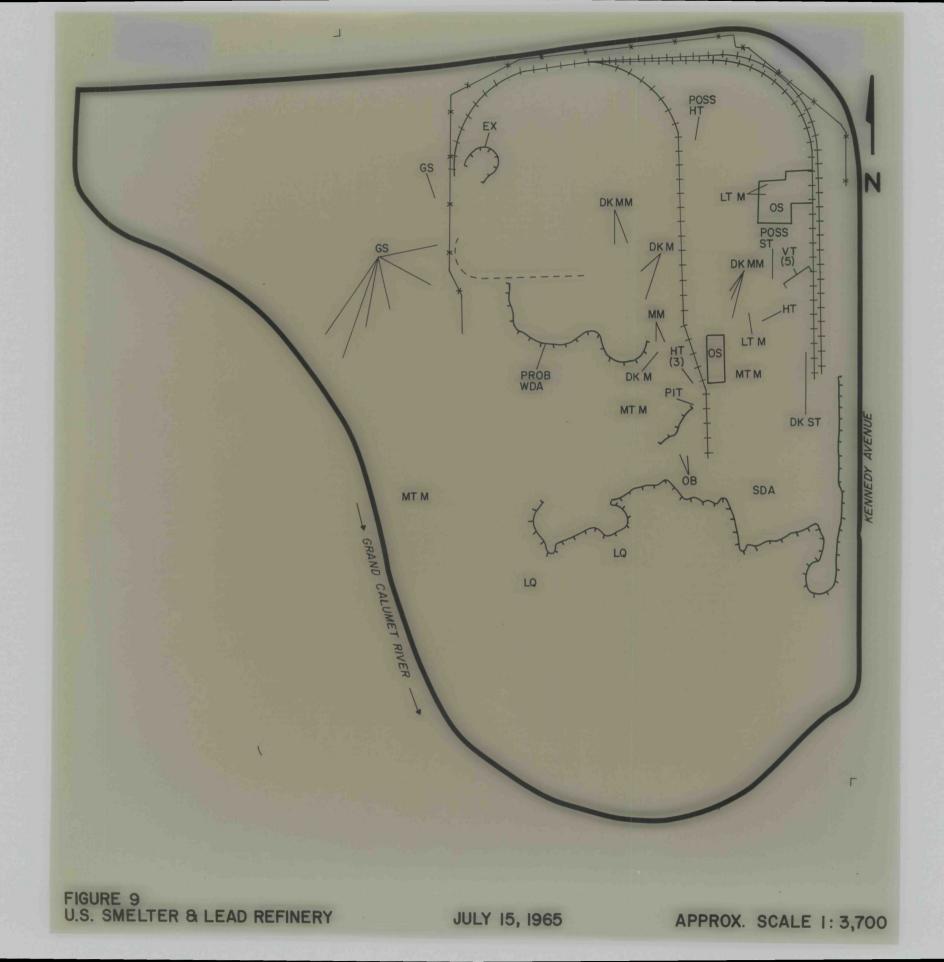
Seven ground scars (GS) are visible in the western portion of the site. These ground scars may have been left from the pipeline ground scar seen in 1961.



U.S. SMELTER & LEAD REFINERY

JULY 15, 1965

APPROX. SCALE 1: 3,700





CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil

- Channelized Drainage
- Edge of Slope
- Feature Boundary

- Site Boundary

AUGUST 23, 1967 (FIGURE 10)

Two light-toned areas of material are visible adjacent to the possible horizontal tank. Two ground scarred areas are noted in the northern portion of the site along the railroad. Two areas of dark-toned material are discernible west of the eastern open storage area. The area of light-toned mounded material along the western fenced area is still present, but no activity is noted in this area at this time. Partial revegetation is apparent in the northern portion of the excavation. Two other areas of dark-toned material which are adjacent to the most northwestern building are still present.

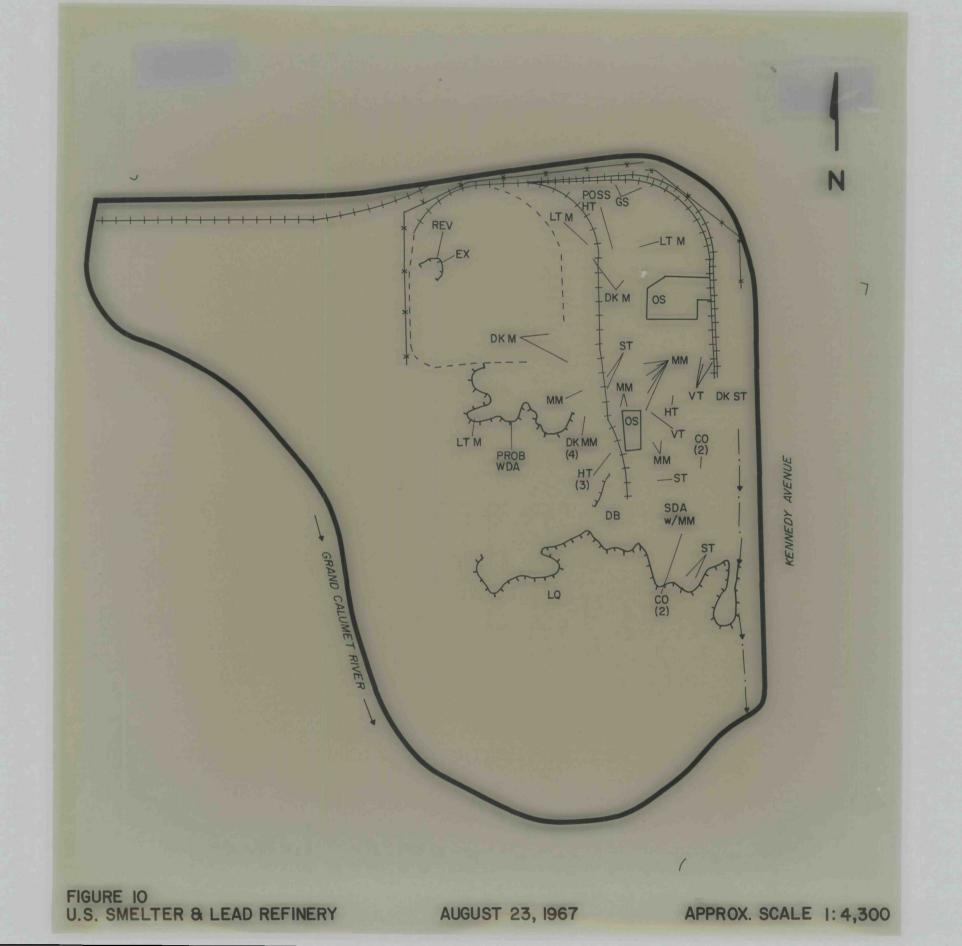
Numerous mounds of variably toned and textured material are evident throughout the facility, especially north of the slag disposal area. Approximately four cylindrical objects and two stained areas are seen within the slag disposal area. Debris is also noted in the western portion of the slag disposal area. Several vehicles (not annotated) are seen within the open storage area east of the discharge channel. Four mounds of dark-toned material are evident at the north end of the discharge channel. The probable waste disposal area appears to contain several piles of debris in addition to the mounded material previously visible. An area of light-toned material is visible in the southwestern portion of the probable waste disposal area.



FIGURE 10 U.S. SMELTER & LEAD REFINERY

AUGUST 23, 1967

APPROX. SCALE 1:4,300



- CO Cylindrical Objects
 D Drums
 DB Debris
 DK Dark-Toned
 EX Extraction Area
 GS Ground Scar
 HT Horizontal Tank
 LD Loading Dock
 LQ Liquid
 LT Light-Toned
 M Material
 MM Mounded Material
 MT Medium-Toned

- MM Mounded Material
 MT Medium-Toned
 NB New Building
 OB Open Burning
 OS Open Storage
 OW Open Water
 R Refuse
 REV Revegetation
 SDA Slag Disposal Area
 ST Stain
 TR Trench
 TT Tank Truck
 U Uplands
 VT Vertical Tank
 W Wetlands

- W Wetlands WDA Waste Disposal Area WS Wet Soil
- Access Road
- Channelized Drainag
- TTTT Edge of Slope - Feature Boundary
- Fence --- - Natural Drainage + + + - Railroad
 - Site Boundary

APRIL 10, 1970 (FIGURE 11)

Two areas of medium-toned mounded material and four areas of light-toned material are visible south and northwest of the horseshoe-shaped loading dock area in the north central portion of the site. An area of probable staining (not annotated) is noted east of the loading dock. Three small mounds of material are seen south of the possible horizontal tank. The large excavation area along the western fence line appears to contain probable liquid. A small network of access roads runs parallel to the fence as well as running east/west along the center of the site. A few possible vehicles (not annotated) are visible near the southwest corner of the access roads, but no other activity is noted in this area. The two areas of dark-toned material which were adjacent to the most northwestern building are still present. Again numerous mounds of variably toned and textured material are evident throughout the facility, especially north of the slag disposal area. One cylindrical object is seen within the slag disposal area. This object may be one of the five vertical tanks seen in the eastern portion of the facility. Debris is still visible in the western portion of the slag disposal area. A large stain is seen within the open storage area east of the discharge channel. A building (not annotated) appears to have been removed from near this open storage area. Three mounds of medium-toned material are seen at the north end of the discharge channel. The probable waste disposal area seen northwest of the discharge channel appears to contain several small areas of debris and mounded material (not annotated) which are still visible from the previous year of analysis. Two large elongated areas of probable wet soil (WS) are visible in the south central portion of the site. One other area of probable wet soil is noted northwest of the facility.

CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material MM - Mounded Material
MT - Medium-Toned
NB - New Building OB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse REV - Revegetation SDA - Slag Disposal Area SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil -- - Access Road
--- - Channelized Drainage TTTT - Edge of Slope - Feature Boundary

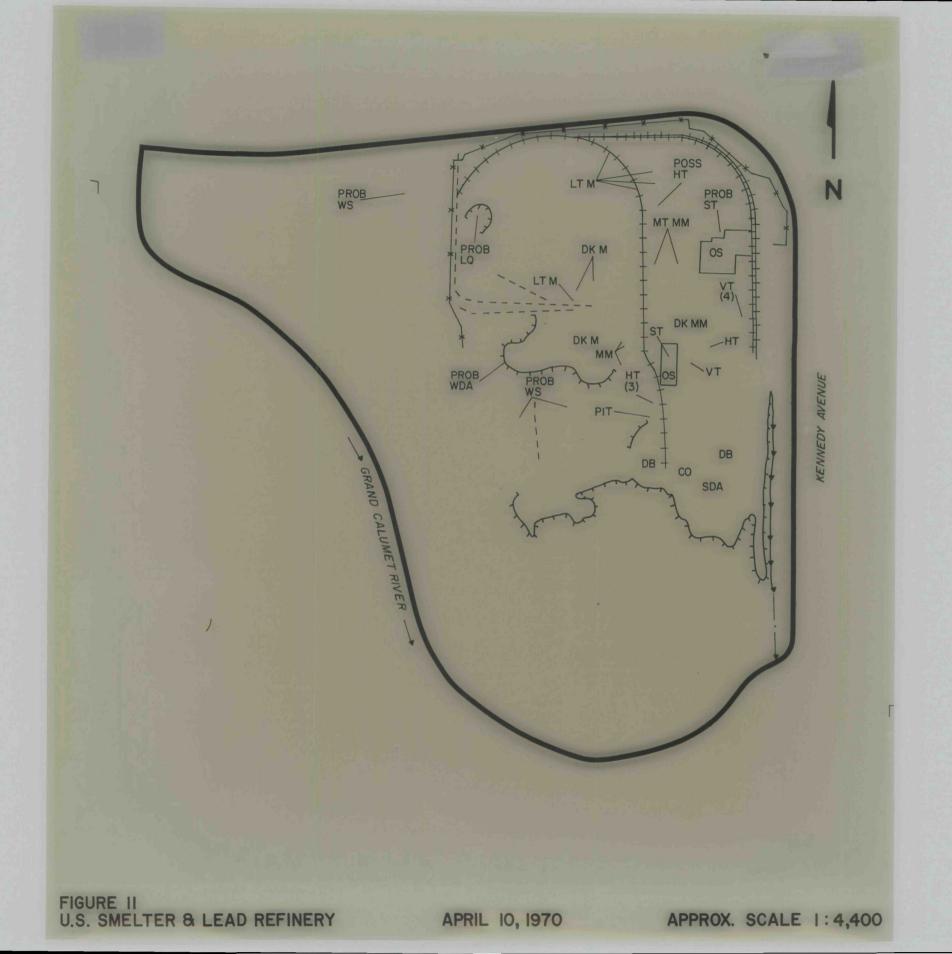
- - Fence - Natural Drainage - Railroad - Site Boundary



FIGURE II U.S. SMELTER & LEAD REFINERY

APRIL 10, 1970

APPROX. SCALE 1:4,400





CO - Cylindrical Objects
D - Drums
DB - Debris

D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil

SEPTEMBER 6, 1973 (FIGURE 12)

The two light-toned areas of material that were visible adjacent to the possible horizontal tank are no longer present. One of the two ground scarred areas noted in the northern portion of the site along the railroad is still visible. No areas of dark-toned material are discernible in the north central area. The area of light-toned mounded material along the western fenced area is still present, but no activity is noted in this area. Partial revegetation has taken place throughout the excavation. Another area of excavation is seen at the same location where an area of dark-toned material was previously noted, adjacent to the most northwestern building. Only a few objects and items (not annotated) are discernible at the eastern open storage area.

Numerous mounds of variably toned and textured mounded material are again evident throughout the facility, especially north of the slag disposal area. Several vehicles are noted within the open storage area east of the discharge channel. Only revegetation activity is noted at the probable waste disposal area that was located along the south edge of the discharge channel. Several mounds of medium-toned material are evident at the north end of the discharge channel. The probable waste disposal area appears to contain several areas of light- and medium-toned material. Also visible in the probable waste disposal area are several ground scarred areas.

- Edge of Slope
- Feature Boundary
- Fence
- Natural Drainage

- Railroad
- Site Boundary

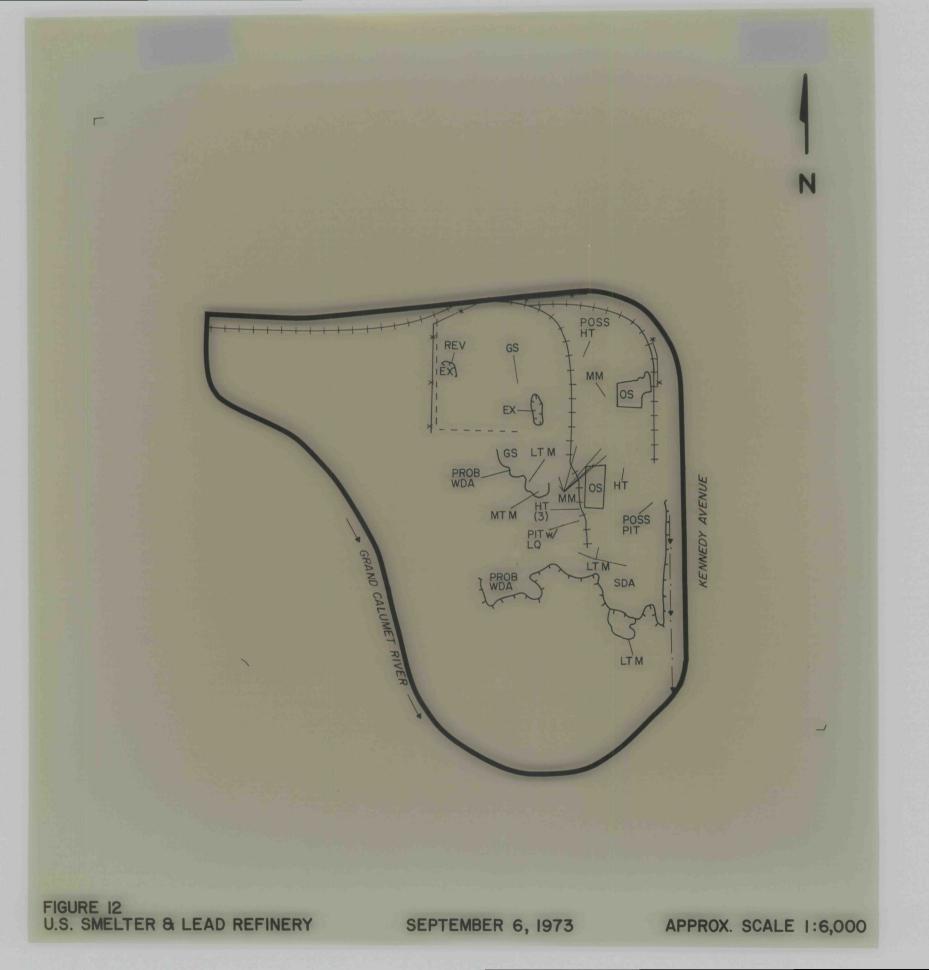
- Site Boundary



FIGURE 12 U.S. SMELTER & LEAD REFINERY

SEPTEMBER 6, 1973

APPROX. SCALE 1:6,000





CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands

W - Wetlands WDA - Waste Disposal Area WS - Wet Soil

++++ - Railroad

- Site Boundary

JUNE 3, 1976 (FIGURE 13)

The 1975 photography was analyzed but not reproduced because of the lack of significant features, activities, and/or change. However, any significant features noted during the 1975 analysis will be annotated and discussed during this year of analysis.

The 1975 photography showed the site just prior to accepting the larger amount of waste, which appears to be refuse (R) and debris. This refuse and debris is especially evident in the area along the western fence line. The large excavation area appears to contain a dark-toned probable liquid. Three truck trailers (TT) are visible southwest of two pits with liquid that were seen in 1975 and a small excavation area which was not seen in 1975. The pits appeared to contain liquid then also. A large mound of medium-toned material is evident in the eastern open storage area. Five areas of light-toned material are visible along the central railroad track and northwest of the possible horizontal tank. Once again numerous mounds of variably toned and textured mounded material are evident throughout the facility, especially north of the slag disposal area. Approximately 25-30 truck trailers are visible in the northeastern portion of the slag disposal area. Several mounds of refuse, debris, and variably toned and textured material are seen in the slag disposal area. Several objects and equipment (not annotated) are visible east of the loading dock (LD) at the south end of the building (not annotated) east of the discharge channel. Several objects are noted within the open storage area east of the discharge channel.

A large mound of dark-toned material is evident at the north end of the discharge channel. The probable waste disposal area contains several areas of light- and medium-toned material, debris, refuse and several probable ground scars (not annotated).

CO - Cylindrical Objects
D - Drums
DB - Debris - Debris
- Dark-Toned
- Extraction Area
- Ground Scar
- Horizontal Tank DK EX GS HT LD LQ LT M - Loading Dock - Liquid - Light-Toned M - Material
MM - Mounded Material
MT - Medium-Toned - New Building - New Bullding
- Open Burning
- Open Storage
- Open Water
- Refuse os R REV - Revegetation SDA - Slag Disposal Area ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands VT - Vertical Tank - Wetlands WDA - Waste Disposal Area WS - Wet Soil

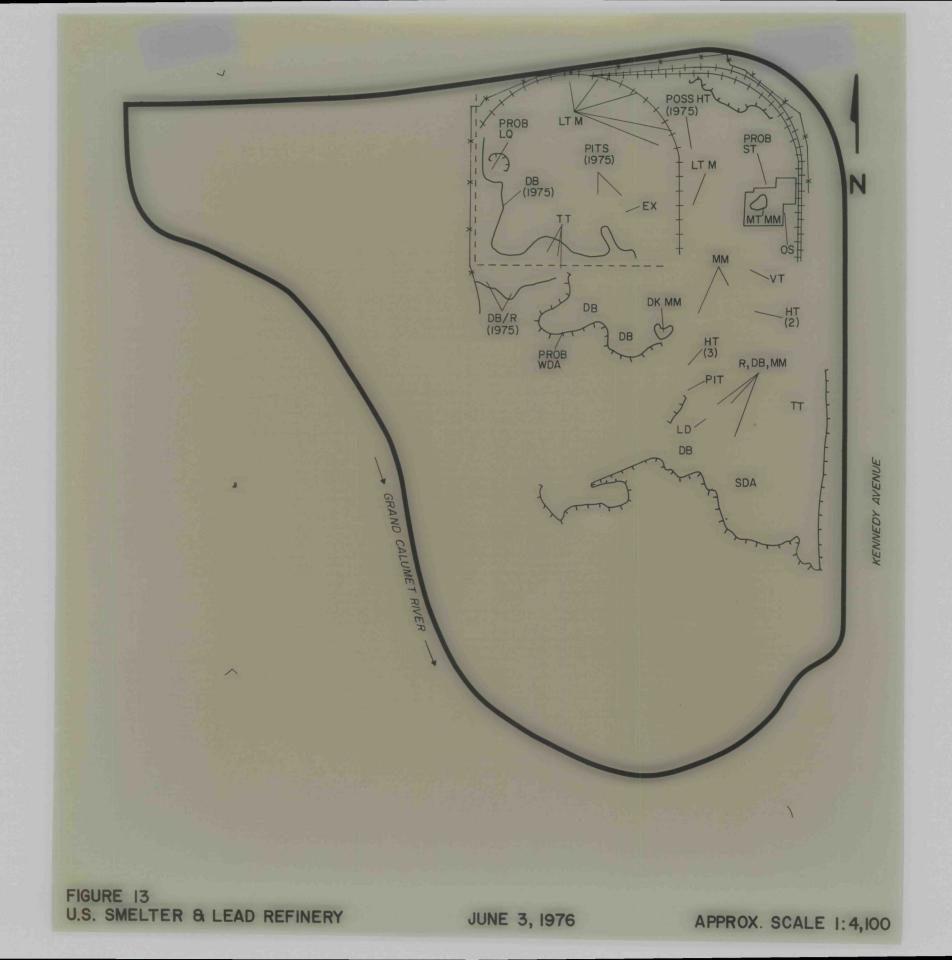
- Fence
- Natural Drainage +++ - Railroad - Site Boundary



FIGURE 13 U.S. SMELTER & LEAD REFINERY

JUNE 3, 1976

APPROX. SCALE 1:4,100





CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil

* - Fence ·-- - Natural Drainage ++ - Railroad

- Site Boundary

APRIL 22, 1983 (FIGURE 14)

Color photography was available for this year of analysis, thus allowing for the addition of color feature descriptions to enter into the analysis. Shading patterns were used on the 1983, 1986, and 1990 prints to demonstrate the extent and locations of the dust and slag material. The fine shading pattern was used to show probable dust areas, and the coarse shading pattern was used to show the probable slag areas.

Although much of the debris and refuse noted in the previous year of analysis is no longer present, several areas are still visible. The eastern open storage area contains several crates and a few mounds of light-colored material. The possible horizontal tank noted in the north central portion of the site has been removed and is no longer present. A pit containing liquid is visible adjacent to several rust-colored probable containers and/or probable bins (not annotated). A small area of light-colored material is also noted south of the pit. Several areas of dark-colored material are discernible in the north central area where excavating was seen in 1976. Four small mounds of dark-colored material and approximately five bins are visible adjacent to the northwestern building. A small group of probable drums (D) is visible south of the westernmost building. The large excavation area along the western fenced area is still present and contains a dark-colored liquid and some probable waste material. Few mounds of material are evident throughout the facility. A rust-colored stain is seen along the eastern portion of the facility. Five dark-colored mounds of material, a pile of refuse and a few other mounds of variably tone and textured material are seen in and near the southern slag disposal area. The open storage area east of the discharge channel is empty. One large mound of medium-colored material is evident at the north end of the discharge channel. The probable waste disposal area appears to contain several areas of light- and medium-colored material, refuse, and debris. Also visible in the probable waste disposal area are several bins and an area of probable liquid.



FIGURE 14 U.S. SMELTER & LEAD REFINERY

APRIL 22, 1983

APPROX. SCALE 1:4,400

HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck

CO - Cylindrical Object.
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar

LEGEND

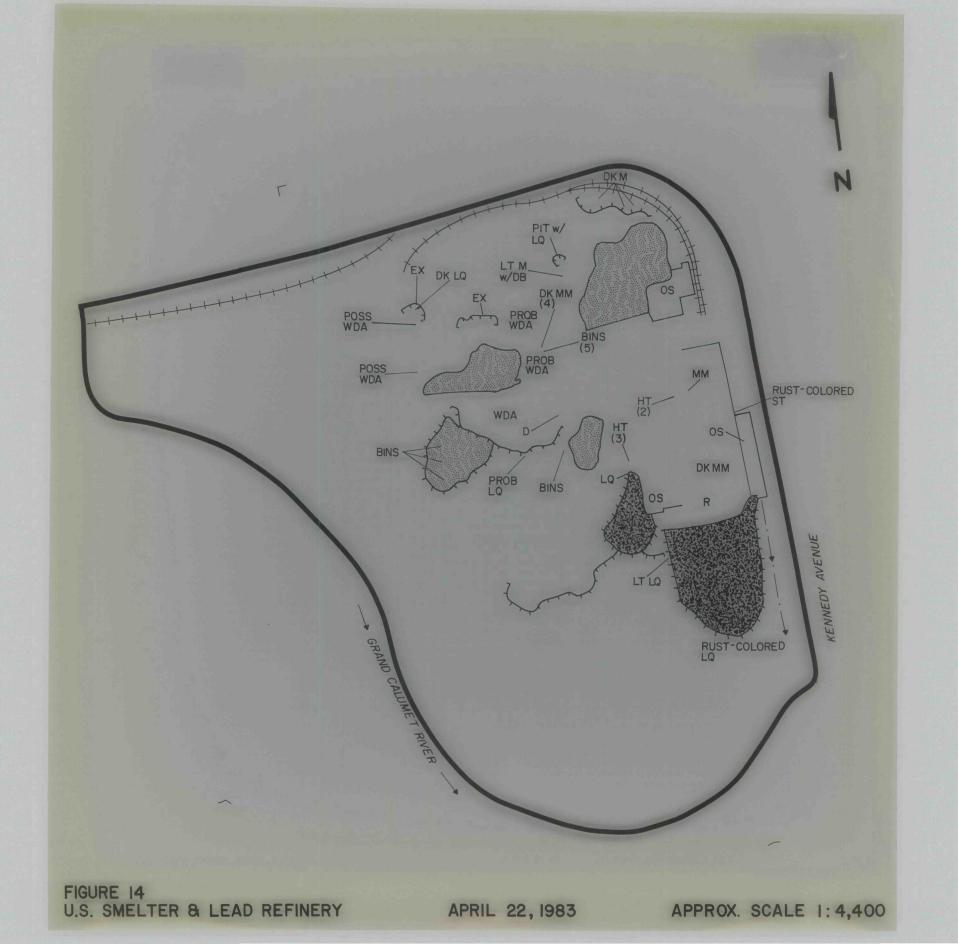
- Tank Truck - Uplands VT - Vertical Tank
W - Wetlands

WDA - Waste Disposal Are WS - Wet Soil

- - Access Road - - Channelized Draina

TTTT - Edge of Slope - Feature Boundary x - Fence

- - Natural Drainage - Railroad
- Site Boundary





In the area west of the facility, a large area of light-colored material containing three bins and some rust-colored material is visible.

MARCH 24, 1986 (FIGURE 15)

According to collateral information from EPA Region 5, the U.S. Smelter and Lead Refinery operated until December 1985. This year of photography shows the site approximately three months after its closing.

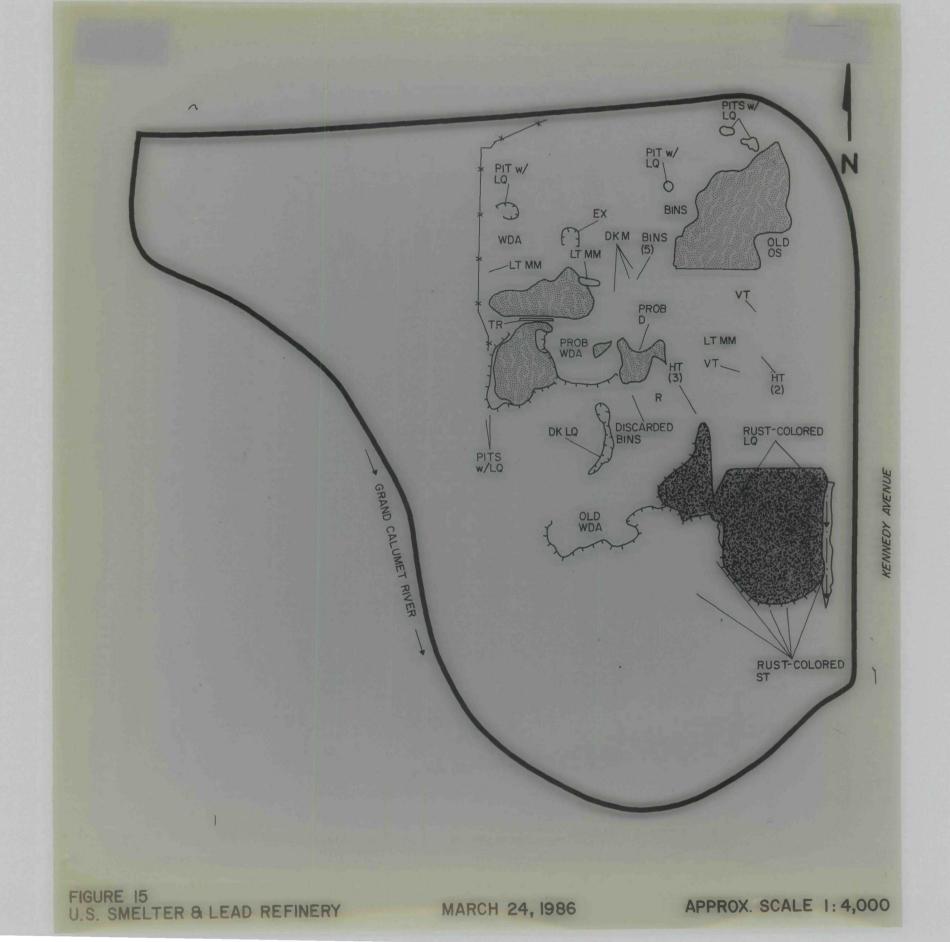
A clean-up operation has apparently been initiated. With the exception of the areas of debris and refuse, no other activity is visible at the site. Four pit areas, all containing liquid, are noted, three in the northern portion and one in the west. A multitude of discarded bins are located just north of the facility. A grey to white area of scattered material is seen north and west of the old open storage area. Three areas of dark-colored material, an area of light-colored mounded material, and a small group of discarded bins are adjacent to the most northwestern building of the facility. An area of light-colored mounded material is seen northeast of the discharge channel. This light-colored mounded material appears to be probable cover material to be used later. The slag disposal area south of the facility contains a large area of dark-colored material and several light to dark grey mounds of material. The slag disposal area is bordered by several areas of rust-colored stains and water. A large area of refuse is visible on the northwest edge of the discharge channel. Another group of discarded bins and probable equipment (not annotated) is seen adjacent to the area of refuse. The probable waste disposal area appears free from the debris and refuse seen in the previous year of analysis. An elongated area of dark-colored liquid and two more pits with liquid are discernible north of the discharge channel. A trench is evident just east of the southern part of the western fence line. The trench is empty, but two small mounds of debris are visible nearby.



FIGURE 15 U.S. SMELTER & LEAD REFINERY

MARCH 24, 1986

APPROX. SCALE 1:4,000





LEGEND

CO - Cylindrical Objects
D - Drums
DB - Debris
DK - Dark-Toned
EX - Extraction Area
GS - Ground Scar
HT - Horizontal Tank
LD - Loading Dock
LQ - Liquid
LT - Light-Toned
M - Material
MM - Mounded Material
MT - Medium-Toned
NB - New Building
OB - Open Burning
OS - Open Storage
OW - Open Water
R - Refuse
REV - Revegetation
SDA - Slag Disposal Area
ST - Stain
TR - Trench
TT - Tank Truck
U - Uplands
VT - Vertical Tank
W - Wetlands
WDA - Waste Disposal Area
WS - Wet Soil

- Feature Boundary X - Fence

- - Natural Drainage - Railroad - Site Boundary

SEPTEMBER 25, 1990 (FIGURE 16)

With the exception of the vegetation growth, not much change has occurred at the site.

The four pit areas which contained liquid are no longer The multitude of discarded bins that were grouped just visible. north of the facility are still present. No change is noted at the grey to white area visible north and west of the old open storage area. The three areas of dark-colored material, an area of light-colored material, and a small group of discarded bins are still visible adjacent to the most northwestern building of the facility. The area of light-colored mounded material seen northeast of the discharge channel is still present as well. The slag disposal area south of the facility contains a larger area of dark-colored material. The slaq disposal area is flanked by two areas of liquid. Two areas of rust-colored stains are seen south of the slag disposal area. The large area of refuse is still visible along the northwest edge of the discharge channel. The group of discarded bins and probable equipment (not annotated) is still adjacent to the area of refuse. The elongated area of dark-colored liquid and two pits are no longer visible north of the discharge channel. The trench is still noted just east of the southern part of the western fence line.



FIGURE 16
U.S. SMELTER & LEAD REFINERY

SEPTEMBER 25, 1990

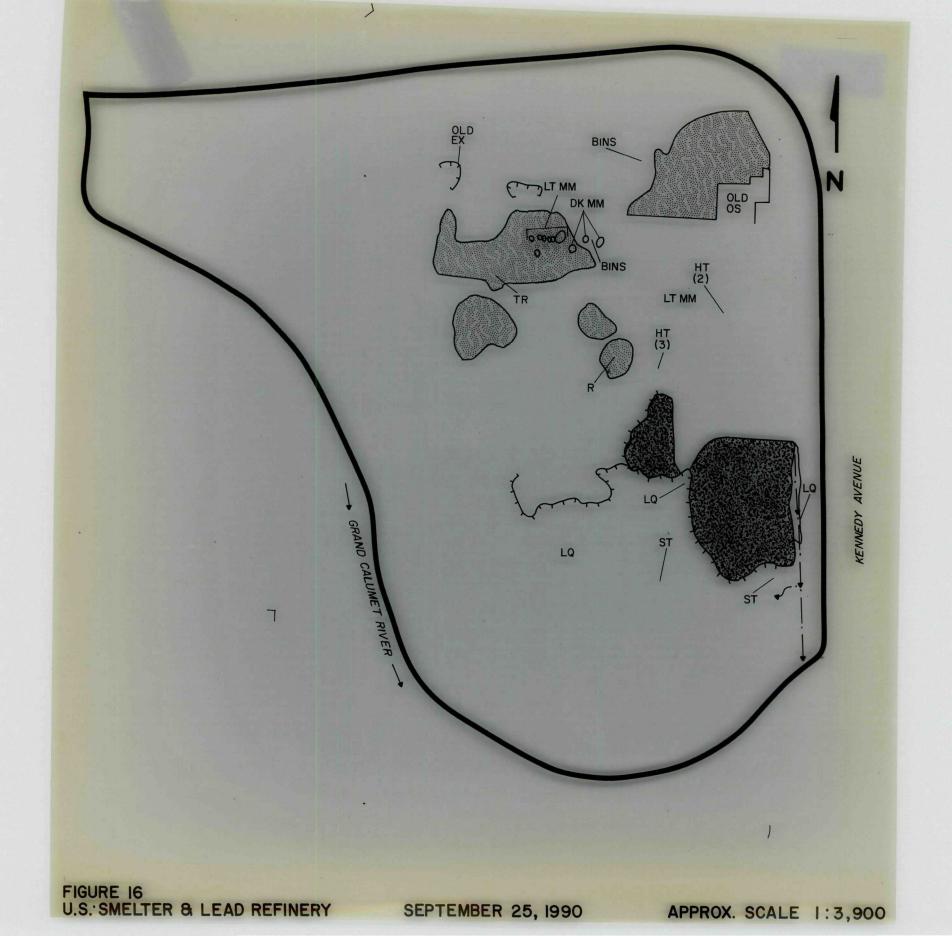
APPROX. SCALE 1:3,900

LEGEND - Cylindrical Objects - Drums - Debris CO D DB DK - Dark-Toned EX - Extraction Area GS - Ground Scar HT - Horizontal Tank LD - Loading Dock LQ - Liquid LT - Light-Toned M - Material MM - Mounded Material - Medium-Toned - New Building MT - Open Burning
- Open Storage
- Open Water
- Refuse OB OS OW R REV - Revegetation SDA - Slag Disposal Area STA - Stain
TR - Trench
TT - Tank Truck
U - Uplands VT - Vertical Tank - Wetlands WDA - Waste Disposal Area WS - Wet Soil --- Access Road
---- Channelized Drainag TTTT - Edge of Slope - Feature Boundary

- - Fence

- Railroad - Site Boundary

- Natural Drainage





- CO Cylindrical Objects
 D Drums
 DB Debris
 DK Dark-Toned
 EX Extraction Area
 GS Ground Scar
 HT Horizontal Tank
 LD Loading Dock
 LQ Liquid
 LT Light-Toned
 M Material
 MM Mounded Material
 MM Medium-Toned
 NB New Building
 OB Open Burning
 OS Open Storage
 OW Open Water
 R Refuse
 REV Revegetation
 SDA Slag Disposal Area
 ST Stain
 TR Trench
 TT Tank Truck
 U Uplands
 VT Vertical Tank
 W Wetlands
 WDA Waste Disposal Area

- WDA Waste Disposal Area WS Wet Soil

- Edge of Slope
- -- Feature Boundary
- reature Boundary

 Fence
 Natural Drainage
 Railroad
 Site Boundary

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June 5, 1939	ASCS	BFJ	6:5-10	1:20,000	25126-25231
April 20, 1949	ILCAS ²		2852,2853A	1: 9,600	38571,38572
December 9, 1951	USGS³	PK.	1:131-134	1:28,500	26504-26506, 38384
July 1, 1954	ASCS	BFJ	1N:57,58, 129-132	1:20,000	20543:92,93; 38476:92; 26582:143-145
September 12, 1958	ASCS	BFJ	2V:91,92, 93,109-111	1:20,000	26582:146,147; 38476:93; 20543:94-96
September 3, 1959	USGS	VZW	1:60-62	1:24,000	20429,20430, 38383
November 29, 1961	ILCAS	61200	389,390	1:24,000	38573,38574
July 15, 1965	ASCS	BFJ	1FF:52,53, 118-120	1:20,000	20543:97,98; 38476:94-96
August 23, 1967	USGS	VBTY	1:33-35	1:24,000	20427,20428, 38382
April 10, 1970	ILCAS	70100	36B:69,70	1:24,000	38575,38576
September 6, 1973	ASCS	18089	173:108,109	1:40,000	20543:99,100
April 22, 1975	ILCAS	75100	69,70	1:24,000	38577,38578
June 3, 1976	NOS ⁴	76B	6096-6098	1:30,000	38601-38603

¹Agricultural Stabilization and Conservation Service, U.S. Department of Agriculture.

²Chicago Aerial Survey, Chicago, Illinois

³U.S. Geological Survey, U.S. Department of the Interior

^{&#}x27;National Ocean Survey, U.S. Department of Commerce

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<u>Date</u> April 22, 1983	Agency EMSL ¹	Mission Code 83/012	Agency Frame # 59-63	<u>Orig.</u> <u>Scale</u> 1:20,000	EPIC Frame # 83/012:59-63
May 9, 1983	USGS	NHAP-81	733:208,209	1:58,000	22532,22533
March 24, 1986	EMSL	86/609	110-116	1:6,000	86/609:110-116
June 5, 1987	USGS	NAPP	212:7,8	1:40,000	21159,21160
September 25, 1990	EMSL	90793	88-90	1:13,000	90/793:88-90
MAPS					
Source USGS USGS NWI ²	Name Highland, IN Whiting, IN Whiting, IN			Scale 1:24,000 1:24,000 1:24,000	Date 1986 1980 based on 1980 aerial photography

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¹Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency

²National Wetlands Inventory, U.S. Fish and Wildlife Service, U.S. Department of the Interior